

WHAT IS CLAIMED IS:

1. A system for regulating the rate at which subscribers can send and receive transmissions over an access network, the system comprising:

a traffic controller; and

a token/leaky bucket having a capacity corresponding to a maximum number of tokens that can be stored in the token/leaky bucket;

wherein tokens escape from the token/leaky bucket at a sustained rate which is related to the quotient of a usage cap and a usage period, and

wherein, in response to a data transmission request, the traffic controller determines whether there is sufficient capacity within the token/leaky bucket to process the request and, if so, allows the data to be transmitted over the access network at a rate of up to a peak transmission rate and deposits tokens into the token/leaky bucket to reflect the transmission.

2. The system of Claim 1, wherein a selected number of tokens is withdrawn from the token/leaky bucket when a subscription is initiated.

3. The system of Claim 1, wherein a selected number of tokens is withdrawn the token/leaky bucket at the beginning of each usage period.

4. The system of Claim 1, wherein additional tokens are periodically withdrawn from the token/leaky bucket.

5. The system of Claim 1, wherein the number of tokens within the token/leaky bucket is brought to zero at the end of each usage period.

6. The system of Claim 1, wherein the number of tokens within the token/leaky bucket is not brought to zero at the end of each usage period.

7. A system for regulating the rate at which subscribers can send and receive transmissions over an access network, the system comprising:

a token generator that periodically generates a first number of tokens corresponding to a usage cap for the subscribers over a usage period;

a leaky bucket into which the token generator periodically deposits tokens, wherein the size of the leaky bucket corresponds to the usage cap; and

a token bucket into which the leaky bucket deposits tokens at a sustained rate,

wherein the sustained rate is related to the quotient of the usage cap and the usage period, and

wherein, if a sufficient number of tokens are present in the token bucket, data is allowed to be transmitted over the access network at a rate of up to a peak transmission rate and tokens are removed from the token bucket to reflect the transmission.

8. The system of Claim 7, wherein the first number of tokens is generated and deposited into the leaky bucket and/or the token bucket once during the usage period.

9. The system of Claim 7, wherein a number of tokens smaller than the first number of tokens is generated and deposited into the leaky bucket and/or the token bucket periodically throughout the usage period.

10. The system of Claim 7, wherein a selected number of tokens is deposited directly into the token bucket when a subscription is initiated.

11. The system of Claim 7, wherein a selected number of tokens is deposited directly into the token bucket at the beginning of each usage period.

12. The system of Claim 7, wherein additional tokens are periodically generated and deposited into the leaky bucket and/or the token bucket.

13. The system of Claim 7, wherein the token bucket is emptied at the end of each usage period.

14. The system of Claim 7, wherein tokens remaining in the token bucket at the end of a usage period rollover such that they can be used as credits toward transmission requests in future usage periods.

15. A system for regulating the rate at which subscribers can send and receive transmissions over an access network, the system comprising:

a traffic control element;

a leaky bucket configured to hold tokens, which leak out of the leaky bucket at a sustained rate which is related to the quotient of a usage cap and a usage period, and

a token bucket configured to hold tokens,

wherein, in response to a data transmission request, the traffic control element checks the number of tokens within the token bucket and, if a selected condition is satisfied, allows the data to be transmitted over the access network at a rate of up to a

peak transmission rate and adjusts the number of tokens in the token bucket to reflect the transmission.

16. The system of Claim 15, wherein the leaky bucket and the token bucket comprise the same bucket.

17. The system of Claim 15, wherein the leaky bucket and the token bucket comprise separate buckets.

18. The system of Claim 15, wherein tokens are deposited into the token bucket when data is transmitted and the selected condition is that the token bucket has sufficient capacity to accommodate the number of tokens corresponding to the transmission request.

19. The system of Claim 15, wherein tokens are withdrawn from the token bucket when data is transmitted and the selected condition is that the token bucket has enough tokens to process the transmission request.

20. An access network comprising:

service provider equipment coupled to a telecommunications network; and  
a plurality of communication links coupled to the service provider equipment,  
wherein a plurality of subscribers can gain access to the telecommunications  
network through the access network, and

wherein the service provider equipment regulates the rate at which the  
subscribers can send or receive data over the access network such that the subscribers  
do not exceed a selected usage cap over a given usage period.

21. The access network of Claim 20, wherein the telecommunications network comprises the Internet.

22. The access network of Claim 20, wherein the service provider equipment comprises a DSLAM, a CMTS, and/or an edge router.

23. The access network of Claim 20, wherein the communication links comprise twisted pair, fiber optic cable, and/or coaxial cable.

24. The access network of Claim 20, wherein the communication links comprise wireless communication paths.

25. The access network of Claim 20, wherein the usage cap and the usage period are selected by a service provider.

26. The access network of Claim 20, wherein the usage period is a day, a week, a month, a quarter, or a year.

27. The access network of Claim 20, wherein the subscribers gain access to the telecommunications network using one or more computers, personal digital assistants, and/or cellular telephones.

28. The access network of Claim 20, wherein the subscribers can send or receive data over the access network at a rate of at least a sustained transmission rate, which is determined at least in part by dividing the usage cap by the length of the usage period.

29. The access network of Claim 27, wherein the subscribers experience a peak transmission rate for a limited number of transmissions at the beginning of the usage period before being throttled down to the sustained transmission rate.

30. The access network of Claim 29, wherein a gradual transition is made from the peak transmission rate to the sustained transmission rate.

31. An access network comprising:

service provider equipment coupled to a telecommunications network and comprising a burst counter having a maximum burst allocation value, wherein the value of the burst counter decreases at a rate greater than or equal to a sustained rate that is based at least in part on the quotient of a selected usage cap and a corresponding usage period; and

a plurality of communication links coupled to the service provider equipment, wherein the communication links enable a plurality of subscribers to gain access to the telecommunications network through the access network, and

wherein, when a transmission request is received, the service provider equipment determines whether the sum of the burst counter value and the size of the transmission request is less than the maximum burst allocation value and, if so, processes the transmission request and increases the value of the burst counter to reflect the transmission.

32. The access network of Claim 31, wherein the telecommunications network comprises the Internet.

33. The access network of Claim 31, wherein the service provider equipment comprises a DSLAM, a CMTS, and/or an edge router.

34. The access network of Claim 31, wherein the communication links comprise twisted pair, fiber optic cable, and/or coaxial cable.

35. The access network of Claim 31, wherein the communication links comprise wireless communication paths.

36. The access network of Claim 31, wherein the usage cap and the usage period are selected by a service provider.

37. The access network of Claim 31, wherein the usage period is a day, a week, a month, a quarter, or a year.

38. The access network of Claim 31, wherein the subscribers gain access to the telecommunications network using one or more computers, personal digital assistants, and/or cellular telephones.

39. A method for regulating the bandwidth usage of subscribers within a telecommunications system, the method comprising:

referencing a selected usage cap for a given usage period;

providing a burst counter having a maximum burst allocation value;

decreasing the value of the burst counter at a rate greater than or equal to a sustained rate, wherein the sustained rate is based at least in part on the quotient of the usage cap and the usage period; and

when a transmission request is received, determining whether the sum of the burst counter value and the size of the transmission request is less than the maximum burst allocation value and, if so, processing the transmission request and increasing the value of the burst counter to reflect the transmission.

40. The method of Claim 39, wherein the usage cap and the usage period are set by a service provider.

41. The method of Claim 39, wherein the maximum burst allocation value is a selected percentage of the usage cap.

42. The method of Claim 39, wherein the burst counter is allowed to reach a negative value equal to the maximum burst allocation value minus the selected usage cap.

43. The method of Claim 39, wherein the burst counter is allowed to reach a negative value equal to the maximum burst allocation value minus the selected usage cap minus an amount of allowed rollover credit.

44. The method of Claim 39, wherein, if the value of the burst counter is positive, then the burst counter decreases at the greater of a minimum guaranteed rate and the sustained rate, and, if the value of the burst counter is negative, then the burst counter decreases at the sustained rate.

45. A method for regulating the bandwidth usage of subscribers within a telecommunications system, the method comprising:

providing a token/leaky bucket having a capacity corresponding to a maximum number of tokens that can be stored in the token/leaky bucket;

withdrawing tokens from the token/leaky bucket at a sustained rate which is related to the quotient of a usage cap and a usage period, and

when a transmission request is received, determining whether there is sufficient capacity within the token/leaky bucket to process the request and, if so, transmitting the data and depositing tokens into the token/leaky bucket to reflect the transmission.

46. The method of Claim 45, wherein a selected number of tokens is withdrawn from the token/leaky bucket when a subscription is initiated.

47. The method of Claim 45, wherein a selected number of tokens is withdrawn from the token/leaky bucket at the beginning of each usage period.

48. The method of Claim 45, wherein additional tokens are periodically withdrawn from the token/leaky bucket.

49. The method of Claim 45, wherein the number of tokens within the token/leaky bucket is brought to zero at the end of each usage period.

50. The method of Claim 45, wherein the number of tokens within the token/leaky bucket is not brought to zero at the end of each usage period.

51. A method for regulating the bandwidth usage of subscribers within a telecommunications system, the method comprising:

generating a first number of tokens corresponding to a selected usage cap for the subscribers over a usage period;

depositing tokens into a leaky bucket, wherein the size of the leaky bucket corresponds to the usage cap; and

transferring tokens from the leaky bucket to a token bucket at a sustained rate, which is related to the quotient of the selected usage cap and the usage period, such that the first number of tokens is deposited into the token bucket during the usage period, and

when a transmission request is received, determining whether a sufficient number of tokens are present in the token bucket to process the request and, if so, transmitting the data and removing tokens from the token bucket to reflect the transmission.

52. The method of Claim 51, wherein the first number of tokens is generated and deposited into the leaky bucket and/or the token bucket once during the usage period.

53. The method of Claim 51, wherein a number of tokens smaller than the first number of tokens is generated and deposited into the leaky bucket and/or the token bucket periodically throughout the usage period.

54. The method of Claim 51, wherein a selected number of tokens is deposited directly into the token bucket when a subscription is initiated.

55. The method of Claim 51, wherein a selected number of tokens is deposited directly into the token bucket at the beginning of each usage period.

56. The method of Claim 51, wherein additional tokens are periodically generated and deposited into the leaky bucket and/or the token bucket.

57. The method of Claim 51, wherein the token bucket is emptied at the end of each usage period.

58. The method of Claim 51, wherein tokens remaining in the token bucket at the end of a usage period rollover such that they can be used as credits toward transmission requests in future usage periods.

59. A method for regulating the bandwidth usage of subscribers within a telecommunications system, the method comprising:

providing a leaky bucket configured to hold tokens;

providing a token bucket configured to hold tokens;

allowing tokens to leak from the leaky bucket at a sustained rate which is related to the quotient of a usage cap and a usage period, and

when a transmission request is received, evaluating the number of tokens within the token bucket and, if a selected condition is satisfied, transmitting the data and adjusting the number of tokens within the token bucket to reflect the transmission.

60. The method of Claim 59, wherein the leaky bucket and the token bucket comprise the same bucket.

61. The method of Claim 59, wherein the leaky bucket and the token bucket comprise separate buckets.

62. The method of Claim 59, wherein tokens are deposited into the token bucket when data is transmitted and the selected condition is that the token bucket has sufficient capacity to accommodate the number of tokens corresponding to the transmission request.

63. The method of Claim 59, wherein tokens are withdrawn from the token bucket when data is transmitted and the selected condition is that the token bucket has enough tokens to process the transmission request.

64. A machine readable medium comprising machine readable instructions for causing a computer to perform a method comprising:

referencing a selected usage cap for a given usage period;

providing a burst counter having a maximum burst allocation value;

decreasing the value of the burst counter at a rate greater than or equal to a sustained rate, wherein the sustained rate is based at least in part on the quotient of the usage cap and the usage period; and

when a transmission request is received, determining whether the sum of the burst counter value and the size of the transmission request is less than the maximum burst allocation value and, if so, processing the transmission request and increasing the value of the burst counter to reflect the transmission.

65. The machine readable medium of Claim 64, wherein the usage cap and the usage period are set by a service provider.

66. The machine readable medium of Claim 64, wherein the maximum burst allocation value is a selected percentage of the usage cap.



67. The machine readable medium of Claim 64, wherein the burst counter is allowed to reach a negative value equal to the maximum burst allocation value minus the selected usage cap.

68. The machine readable medium of Claim 64, wherein the burst counter is allowed to reach a negative value equal to the maximum burst allocation value minus the selected usage cap minus an amount of allowed rollover credit.

69. The machine readable medium of Claim 64, wherein, if the value of the burst counter is positive, then the burst counter decreases at the greater of a minimum guaranteed rate and the sustained rate, and, if the value of the burst counter is negative, then the burst counter decreases at the sustained rate.